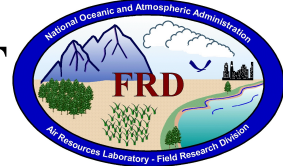


FRD ACTIVITIES REPORT

April - June 2009



RESEARCH PROGRAMS

ET Probe

The upgraded data system for the Extreme Turbulence (ET) Probe is completely assembled and undergoing testing. The data system consists of two separate subsystems. Data collection is accomplished by electronic filters and a data acquisition board installed directly inside the probe's sphere. Anti-aliasing filters are used on all the analog data channels to limit the amount of oversampling required. Digitized 50 Hz data are sent via a serial link to the data processing subsystem, which is an external single-board computer running Linux. This computer executes software to calculate winds from the raw pressure measurements and can save both the raw data and the derived wind observations. For maritime applications, it was decided to keep the computer in a housing external to the sphere in order to improve the chances of data recovery even if the ET Sphere itself is damaged or lost in a hurricane. Currently, data are stored on a 32 Gb SDHC card which has the advantage of no moving parts, small size, and very low power requirements. The entire system including probe and all data processing components requires only 12 watts of power.

The temperature sensors originally used in the probes are no longer manufactured and have been replaced by thermocouple-based sensors that use a AD594 thermocouple amplifier. This design was first suggested by ATDD and has proven to be an inexpensive and reliable substitute for the old temperature sensors.

An initial test of an upgraded probe was conducted on June 25 by mounting the system on a vehicle (Fig. 1) and driving at highway speeds. Initial analysis of the road-test data indicates the new probe functions as expected based on our experience with the old design. One issue that did crop up was some noise in the static pressure signal, and this is being investigated. (Rick.Eckman@noaa.gov, Roger Carter, Randy Johnson, Shane Beard, Tom Strong)



Figure 1. ET Probe mounted on truck.

EPA Roadside Sound Barrier Tracer Study

The manuscript “Tracer studies on the effects of roadside noise barriers on near-road pollutant dispersion in varying atmospheric stability conditions” passed ARL review and was submitted to the journal Atmospheric Environment. It is presently under review there.
(Dennis.Finn@noaa.gov)

WISDOM

FRD will be responsible for WISDOM balloon launches during the month of September in Bermuda, Azores, and Senegal. Contacts in each of these countries have been established to assist us in locating a suitable facility for balloon inflation and launches. A trip is being planned to visit each of these countries to present WISDOM goals, finalize launch locations, establish in-country contact points, and possibly identify trainees to assist in this work.

LAMP Proposal

The LAMP (Low Altitude Measurement Platform) proposal is a low cost, long term, simple to use balloon system that would be used in large numbers to provide information from “data poor” regions in the Atlantic. Data from LAMP would be used to help understand and characterize the evolution of the energy content of the lower marine boundary-layer inflow to hurricanes, its relationship with hurricane intensity changes, the influence of ocean temperature, and estimates of surface fluxes. Measurements that LAMP would make just 30 to 70 meters above the ocean surface include:

1. Balloon position (latitude, longitude and altitude)
2. Wind speed
3. Wind direction
4. Barometric pressure
5. Air temperature
6. Relative humidity
7. Sea surface temperature
8. Solar radiation

The proposal is currently undergoing internal ARL review.

NOAA/IDAHO NATIONAL LABORATORY (INL) METEOROLOGICAL RESEARCH PARTNERSHIP

Emergency Operations Center (EOC)

The INL Emergency Operation Center was activated for an emergency on 22 June. The nature of the emergency was a bulging 55 gallon drum that contained a biocide agent to destroy algae in water pipes inside the Advanced Test Reactor cooling system. FRD contributed by providing

nowcasts and short term forecasts, and by operating the MDIFF transport and dispersion model during the event.

The INL Emergency Operations group requested that we provide a set of pre-planned weather conditions for the annual INL exercise to be conducted in August. These data sets are loaded onto our server computers simultaneously with the actual data being collected from the INL Mesonet. The client computers that display the weather conditions and operate the dispersion model may then select to display and use the current actual weather conditions or these pre-planned weather conditions. During the exercise, the participating groups will be instructed to switch their computers to the pre-planned weather data files. The requested set has been generated and checked and will be placed on the server in late July. (Roger.Carter@noaa.gov)

New INL Hazardous Weather Alert System

A large upper level trough entrenched over much of the Western United States kept the weather across the INL fairly active over the last few months. The active weather generated a total of 17 different INL weather alerts/statements that were not issued by the National Weather Service. Thirteen of those INL alerts/statements resulted from nearby lightning strikes, while the other four resulted from high winds caused by frontal systems passing the area. The wind statement/alerts were issued approximately 1 hour and 10 minutes before the high wind criteria was met, giving ample time for INL personnel to prepare for each event. (Neil.Hukari@noaa.gov)

Transport and Dispersion Modeling

The modified Con2dose radiological modeling program, originally developed by the ARL HQ HYSPLIT group, was able to generate maps for up to 8 dose types and 2 additional concentration/deposition parameters for one radionuclide at a time. This program has been modified to also accommodate the following:

- The combined doses (rem) from multiple nuclides, up to 16 nuclides per simulation
- Generate individual concentration and deposition maps for each nuclide included in the simulation in $\mu\text{Ci}/\text{m}^3$ and $\mu\text{Ci}/\text{m}^2$, respectively

An effort has been made to retain the functionality of the existing programs as much as possible. Therefore, edits of the code have emphasized adding features without taking away from existing functionality. Some modifications have also been made to the Doseplot plotting program with this in mind. Doseplot generates the radiological maps using the output from Con2dose. The Doseplot modifications include adding options for the choice of EAL contours as requested by our INL partners while retaining the EPA PAG options. The table of dose conversion factors will also be altered to reflect the needs of INL, but it will be a simple matter of having more than one table available.

However, we have made significant changes to the subroutine in Doseplot that generates the output files for plotting the contour intervals. Originally this subroutine generated KML files for use in Google Earth. It has been rewritten and simplified and the output is now in the form of a text file customized for use in the Google Maps application also under development. We believe

that it would be possible to accommodate both the original Google Earth and Google Maps options within the same program if it was determined that this was desirable.

The choice of Google Maps instead of Google Earth stems from decisions relating to the need to customize and optimize the application for our INL partners. The user interface is still web-based and is being developed within the Flash API programming environment. The interface will offer a significantly different appearance and utility than the existing Google Earth format. A basic working prototype of the interface exists but there is still work to be done to get it into final form.

We have successfully tested code and a script for building any desired multiple nuclide HYSPLIT control file and initiating a radiological dispersion run from the web interface. The initial focus is on the use of preconfigured release scenarios identified by INL (i.e. known nuclides, maximum release rates, deposition parameters). Work is in progress for implementing the means to identify and archive the results of multiple runs by multiple users. This includes an effort to have the option to share output with other users if desired. Preliminary benchmark testing was completed for optimizing the grid spacing and number of particles with respect to number of nuclides used, model simulation time, plume plot quality and resolution, and computer runtime. Plumes for shorter simulation times tend to have blocky edges and it is necessary to reduce the grid spacing and/or increase the number of particles. A contour smoothing algorithm has also been developed to help with this issue.

There is still a considerable amount of work to be done with regard to linking the various components of the modeling system in the background (e.g. spawning model runs, constructing command lines, feedback to the user, etc.). We also still need to complete development of the scheme for using meteorological observations from the INL mesonet as input to HYSPLIT. (Dennis.Finn@noaa.gov, Brad Reese, Jason Rich, Roger Carter, and Rick Eckman)

As part of a relicensing effort for the Advanced Test Reactor at INL, FRD was asked to perform an analysis of five years of data from the INL Mesonet and provide the results in two file formats used by Nuclear Regulatory Commission dispersion models. The data analysis was largely completed by June and will wrap up in July. (Neil.Hukari@noaa.gov, Rick Eckman, Donna Harris, and Kirk Clawson)

NOAA INL Mesoscale Meteorological Network (Mesonet)

Our single frequency radio network used to collect data from the Mesonet occasionally experiences winter weather-related degraded operations. It seems that marginal radio links to some stations confuse or overload the software collecting the data to the point that data collection stops or becomes extremely intermittent. Since this past spring, we have been working with the software vendor, Campbell Scientific, to find a solution to the problem. A number of tests were conducted early this spring which attempted to duplicate the observed problem by intentionally degrading radio links. These were unsuccessful, leading to a belief that the problem may be related to temperature related frequency shifts in the radios. Campbell Scientific provided an upgrade to the software that seems to have fixed some of the problems. They also provided a day of training for us on June 16 that helped us to understand system

operations and identify a number of possible improvements that could be made to the system at minimal cost. These will be implemented over the next few months. (Roger.Carter@noaa.gov, Brad Reese, Randy Johnson, Shane Beard, Tom Strong)

An error in the Mesonet precipitation data that was being sent to MADIS has been discovered and corrected. Apparently, there was a misunderstanding on the units of the precipitation numbers that were being sent when the system was set up, so an incorrect conversion factor was used. (Roger.Carter@noaa.gov, Neil Hukari, Brad Reese, and Tom Strong)

Miscellaneous

FRD worked with the Idaho Cleanup Program (ICP) and Washington Group, Inc. (WGI) on removing a temporary inflatable storage building at the INTEC facility on the INL. Light winds and sunny skies were required to successfully deflate and remove the tent. We provided a 2-month climatology of favorable conditions in April and May and then began providing detailed 3-hour forecasts out to 7 days at the start of April. The cover was successfully deflated and removed on April 17. Fig. 2 shows the deflation sequence recorded by our weather camera. (Neil.Hukari@noaa.gov and Jason Rich)

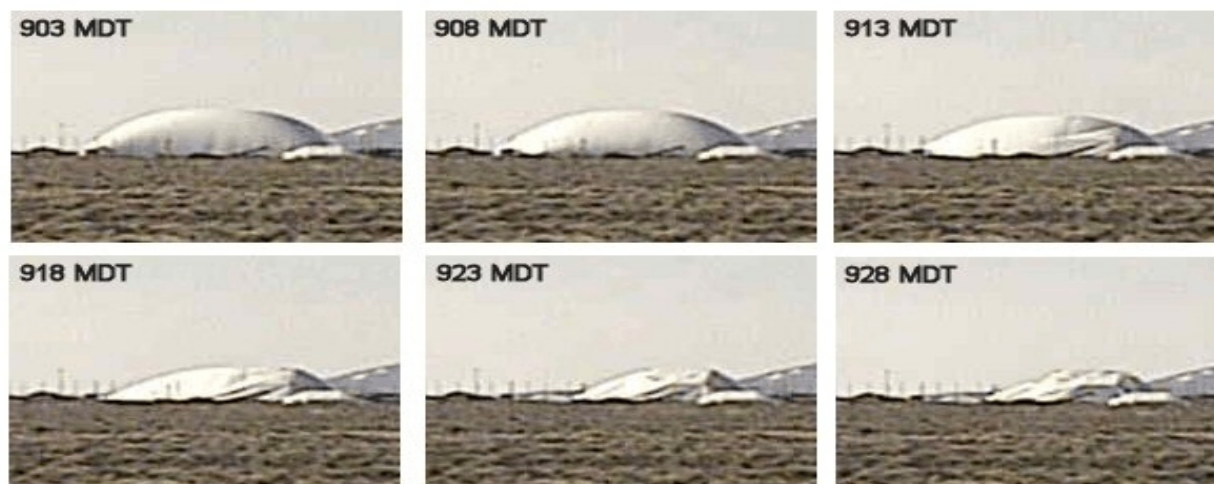


Figure 2. Deflation sequence of a temporary inflatable storage building at INTEC on the INL.

OTHER ACTIVITIES

Outreach

Rick Eckman is on the advisory committee of a Ph.D candidate at the University of Wyoming. The committee met in May to give the student a qualifying assessment, which he passed.

The Ask a Scientist series has appeared in the Idaho Falls Post Register (the local newspaper) for some time and provided a way for local students to submit questions to scientists. It is now wrapping up. In ending the series, the paper asked for profiles on the scientists involved, with

emphasis on how they became interested in science and pursued a career in science. A brief profile was submitted. (Rick.Eckman@noaa.gov)

Papers

Kirk L. Clawson, NOAA/ARL, Idaho Falls, ID; and R. Eckman, T. Pierce, R. Carter, D. Finn, S. Perry, and V. Isakov, 2009: 2008 Roadway Sound Barrier Atmospheric Tracer Study. *Eighth Symposium on the Urban Environment, Special Symposium on Measurements in the Urban Environment and Observations*. Phoenix, AZ, Amer. Meteor. Soc., JP1.6.

Clawson, K.L., D. Finn, R.G. Carter, J.D. Rich, R.M. Eckman, S.G. Perry, V. Isakov, D.K. Heist, and T. Pierce, 2009: NOAA EPA Near-roadway Sound Barrier Atmospheric Tracer Study 2008. International Technical Meeting on Air Pollution Modeling and its Application, 30th NATO/SPS.

Clawson, K.L., R.M. Eckman, R.C. Johnson, R.G. Carter, D. Finn, J.D. Rich, N.F. Hukari, T. Strong, S. Beard, and B.R. Reese, 2009: Near Roadway Tracer Study 2008. NOAA Technical Memorandum ARL- (passed ARL review)

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, R.M. Eckman, S.G. Perry, V. Isakov₂, and D.K. Heist, 2009: Tracer studies on the effects of roadside noise barriers on near-road pollutant dispersion in varying atmospheric stability conditions. (In review at *Atmospheric Environment*)

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, and C. Biltoft, 2009: Observations of Concentration Variability in Tracer Plumes in an Urban Boundary Layer with Considerations for Emergency Response. (Submitted to *Environmetrics*)

Perry, S.G., D.K. Heist, V. Isakov, T. Pierce, **K.L. Clawson, and R. Eckman**, 2009 Near-roadway Tracer Study 2008. International Technical Meeting on Air Pollution Modeling and its Application, 30th NATO/SPS International Technical Meeting on Air Pollution Modelling and its Application. 18-22 May, 2009, San Francisco.

Vette, A., R. Williams, T. Barzyk, L. Baxter, R. Baldauf, V. Isakov, D. Olson, S. McDow, S. Kimbrough, R. Shores, D. Whitaker, C. Croghan, G. Norris, J. Hirtz, V. Martinez, K. Black, S. Perry, D. Heist, T. Pierce, **K. Clawson, R. Eckman**, G. Hagler, I. Gilmour, L. Neas and D. Costa, 2009: Near-Road Research at EPA, 2009 Bernstein Symposium - Air Toxics Workshop University of Michigan, Ann Arbor May 6-7.

Safety

FRD staff reviewed the “What to do in case of an emergency” video by Digital 2000, Inc. at the April staff meeting.

On May 14, 2009, FRD staff participated in an unannounced evacuation drill. Everyone evacuated quickly and without incident. The drill was an excellent learning experience.

Training

All FRD employees completed the Annual Security Briefing for Un-cleared employees, ES&H Awareness Refresher Training, and Counterintelligence required by INL.

All FRD employees completed the 2009 Annual NOAA Safety & Environmental training.

Travel

Kirk Clawson to San Francisco, CA, May 17-22, to attend 30th NATO International Technical Meeting on Air Pollution Modeling.

Donna Harris to Ann Arbor, MI, June 22-25, to attend the NOAA Administrative Officer Management Conference.